



# hydro flame

1874 SOUTH PIONEER ROAD • SALT LAKE CITY, UTAH 84104

## Excalibur

### 8500 SERIES OWNERS MANUAL

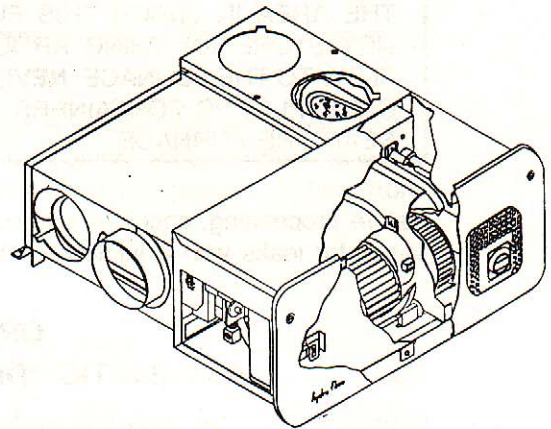
**IMPORTANT INSTRUCTIONS  
MUST STAY WITH UNIT  
OWNER — READ CAREFULLY  
KEEP FOR FUTURE  
REFERENCE**



engineers

TERRALAB  
ENGINEERS INC.  
LISTED

GAS FIRED HEATING APPLIANCE FOR  
MOBILE HOMES OR RECREATIONAL  
VEHICLES TESTED TO STANDARD U.L.  
307 (b).



Forced Air Direct-Vent  
(Sealed Combustion) Furnace for  
installation in (Mobile Homes) or  
Recreational Vehicles



APPROVAL  
CERTIFIED BY C.G.A.

#### FOR YOUR SAFETY

If you smell gas

1. Open all windows
2. Don't touch any electrical switches
3. Extinguish any open flame
4. Vacate premises until ventilation is complete and gas source is found and corrected.
5. Immediately call you supplier.

#### FOR YOUR SAFETY

Clothing or other flammable material should not be placed on or near the appliance.

Do not store or use gasoline or other flammable vapors, liquids in the vicinity of this or any other appliance.

Children and adults should be alerted to the hazards of high surface temperatures and should stay away to avoid burns or clothing ignition.

Young children should be carefully supervised when they are in the same room as the appliance.

#### WARNING:

THIS UNIT MUST BE SERVICED ONLY BY AN AUTHORIZED SERVICEMAN. MODIFICATION OF THE APPLIANCE CAN BE EXTREMELY HAZARDOUS AND COULD LEAD TO SERIOUS INJURY OR DEATH.

FUEL BURNING APPLIANCES GENERATE TOXIC FLUE PRODUCTS. MODIFICATION OR IMPROPER MAINTENANCE CAN CAUSE CARBON MONOXIDE IN DEADLY AMOUNTS. TO PREVENT THIS, MAINTAIN APPLIANCE IN SAFE OPERATING CONDITION.

DO NOT BLOCK OR MODIFY ANY COMBUSTION AIR OR FLUE GAS PASSAGEWAYS.

DO NOT ADD ANY DEVICES OR ACCESSORIES TO THIS APPLIANCE EXCEPT THOSE SPECIFICALLY AUTHORIZED BY HYDRO FLAME.

ALWAYS CONSULT YOUR AUTHORIZED SERVICEMAN FOR ANY PROBLEMS OR QUESTIONS YOU MAY HAVE PERTAINING TO THIS APPLIANCE.

ALWAYS INSPECT THE APPLIANCE BEFORE STARTING A NEW HEATING SEASON, PAYING SPECIAL ATTENTION TO COMBUSTION AIR, FLUE GAS PASSAGEWAYS AND FUEL LINES.

**WARNING: IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE CAN CAUSE INJURY OR PROPERTY DAMAGE. REFER TO THIS MANUAL FOR ASSISTANCE OR ADDITIONAL INFORMATION, CONSULT A QUALIFIED INSTALLER, SERVICE AGENCY OR THE GAS SUPPLIER.**

THE AREA IN WHICH THIS FURNACE IS INSTALLED MUST BE KEPT CLEAN. **DO NOT** STORE ANYTHING AROUND THE FURNACE THAT WILL RESTRICT THE AIR FLOW TO THE FURNACE. **NEVER** PLACE HAZARDOUS MATERIAL SUCH AS AEROSOL CANS, PLASTIC CONTAINERS, GASOLINE, OR ANY OTHER FLAMMABLE MATERIALS NEAR THE FURNACE.

Before proceeding, check all gas connections with a soap solution to detect any leaks. **NEVER** check for leaks with a lighted match.

## OPERATING INSTRUCTIONS AUTOMATIC "DIRECT SPARK" IGNITION MODELS

Important: Failure to follow these lighting instructions exactly may result in damage to the furnace.

1. Set thermostat on "off" position.
2. Turn gas valve to "off" position. (If furnace is so equipped). Wait 5 minutes. See figure 1A (Gas valve is located behind electrical panel door. To remove, slide handle to the right and pull forward).
3. Turn gas valve to "on" position. See figure 1A. Set thermostat to "on" position and adjust to desired setting.
4. Allow 15 to 30 seconds for burner to ignite.
5. If burner does not light, set thermostat on "off" position wait 60 seconds then re-set thermostat to "on" position.
6. If ignition is not obtained after 3 tries, go to complete shut down and determine cause.
7. Turn gas valve knob to "off" position if furnace is so equipped. See figure 1A.
8. Set thermostat to "off" position.
9. To open outside panel turn slotted fastener  $\frac{1}{4}$  turn. To close door push until snap.

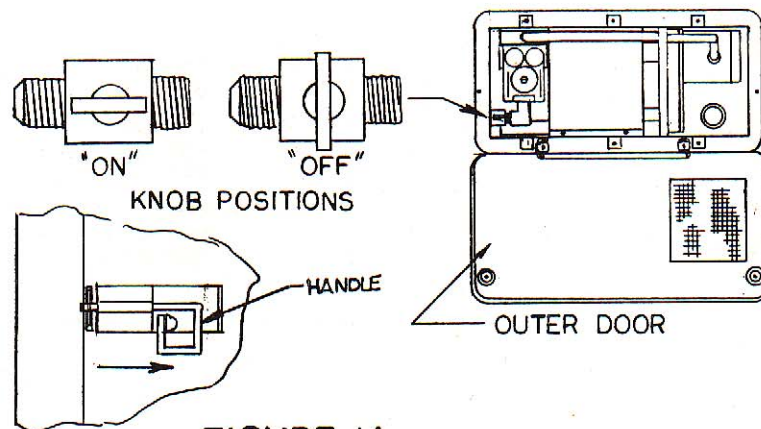


FIGURE 1A

### SEQUENCE OF NORMAL OPERATION

1. When the thermostat calls for heat, a delay of 15 to 30 seconds will elapse before the time delay relay energizes the fan motor.
2. When the fan motor reaches approximately 75% of the normal R.P.M. (within 1 to 2 seconds) the sail switch, in response to the air flow, will engage allowing current flow to the gas valve, through the direct spark ignition module.

3. The gas valve will open and allow gas to flow to the main burner, where it is ignited by the direct spark ignition system.
4. If the thermostat is satisfied or turned down, the gas valve will close and the flame on the main burner will go out. The blower will continue to run for a short period of time, and will then shut off. The purpose of this is to remove most of the remaining gases and heat from the heat exchanger.

### TIME DELAY FAN RELAY

This relay controls the sequence of the blower operation. When the bimetal disc of the relay is heated internally to its operating temperature, the switch closes. This completes the circuit to the motor. The blower will continue to run as long as the relay is hot even though the thermostat is satisfied and the main burner is off. When the relay sensor cools after the thermostat is satisfied, the switch opens and the blower shuts off.

### LIMIT SWITCH

The purpose of the limit control is to open the circuit to the main burner if for any reason the furnace becomes abnormally hot. If the circulating air system is blocked, even partially, the limit control will function and cause the main burner to cycle. If cycling of the limit control occurs, the circulating air passage should be thoroughly cleaned, the ducts and register checked for restriction check for 12 volts to the furnace. If the limit control is damaged, it cannot be repaired. It must be replaced with a new one.

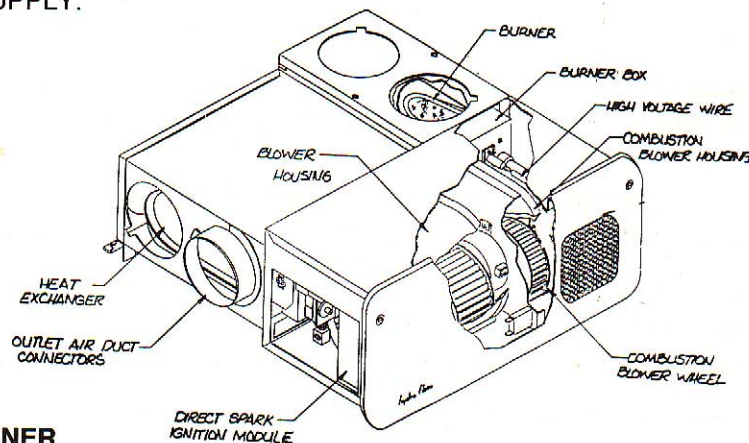
**CAUTION: NEVER SHORT ACROSS OR BYPASS THE LIMIT CONTROL EVEN FOR ONLY TEMPORARY OPERATION.**

### AIR SWITCH

The circulating air switch has two purposes:

1. It is an "air prover." It operates in response to the flow of air generated by the blower wheel. Hence, if for any reason the air from the blower wheel is not sufficient, the switch will not operate. One cause of insufficient air is a slow motor caused by low voltage.
2. The switch allows time for the blower to pull in a sufficient amount of air for combustion before it engages. Once it closes, power is supplied to the direct spark ignition module and the ignition cycles starts.

**WARNING: SHOULD OVERHEATING OCCUR, OR THE GAS SUPPLY FAIL TO SHUT OFF, SHUT OFF THE MANUAL GAS SUPPLY VALVE TO THE FURNACE BEFORE SHUTTING OFF THE ELECTRICAL SUPPLY.**



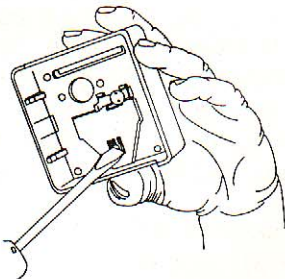
### BLOWER ASSEMBLY BURNER

One motor is used to drive both the combustion air and the circulating air blower wheels. Although one motor drives both wheels, the blowers are separate. The combustion air blower is sealed so as to allow no passage of air between it and the circulating room air blower. The combustion air blower draws air from the outside atmosphere and into the burner box, then the gas controls allow gas to flow into the burner where it is mixed, then expelled through the burner screen where it is ignited in the combustion chamber. See figure.

## MAINTENANCE AND CLEANING

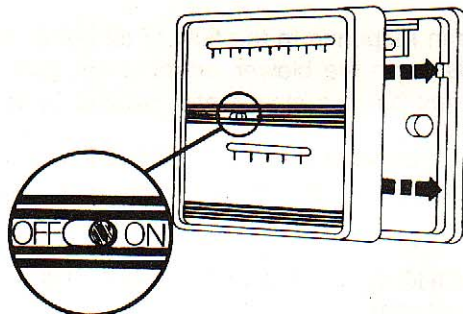
NOTE: For continued satisfactory performance of this unit, it is necessary that the control compartment be kept clean. It is also important that the appliance area be clean and free of combustible materials, vapors and liquids.

Routine inspections maintenance and cleaning of venting system and gas connections is recommended at least on a yearly basis, or as required. The motor is permanently lubricated and sealed and requires no oiling.



## THERMOSTAT

1. Thermometer adjustment for correct temperature setting. Move control lever so that your heater comes on (about 3 degrees below room temperature). When the heater shuts off, your thermometer should match your level setting. If it doesn't, remove cover and turn the small inside slotted shaft on the inside of the cover until thermometer reading and thermostat lever setting match.
2. When snapping the cover onto thermostat base make sure that "on-off" switch is in the "on" switch position. This will allow the switch to function properly. Turn the switch to "off" when the furnace is not in use. Failure to do so may cause battery drain.



## SERVICE HINTS, DIAGNOSIS AND CORRECTIVE MEASURES

INSTALLATION AND SERVICE SHOULD BE DONE ONLY BY A QUALIFIED SERVICE PERSON. THE APPLIANCE SHOULD BE INSPECTED BEFORE USE AND AT LEAST ANNUALLY BY A PROFESSIONAL SERVICE PERSON. MORE FREQUENT CLEANING MAY BE REQUIRED DUE TO EXCESSIVE LINT FROM CARPETING, BEDDING MATERIAL, ETC. IT IS IMPERATIVE THAT CONTROL COMPARTMENTS, BURNERS AND CIRCULATING AIR PASSAGEWAYS OF THE APPLIANCE BE KEPT CLEAN.

## SHORT CIRCUIT CHECKOUT

If fuses are blown or circuit breaker is tripped, short is indicated and should be checked.

1. Turn off all appliances including furnace.
2. Install an ammeter on the positive (+) side of the battery. Amperage reading should be (0). If the amperage reading ceases, the furnace electrical system is shorted or miswired and should be checked.

## AMPERAGE DRAW THROUGH FURNACE WITH THERMOSTAT "OFF"

1. Incorrect wiring. If the 12 volt and thermostat wires are not connected properly at the furnace a continuous circuit can be created through the heater of the fan relay. If this condition exists, the blower will start as soon as the thermostat closes and will shut off when the thermostat opens, instead of having a delayed action. In some cases this will also burn out the thermostat. Refer to the wiring diagram for correct connections.
2. Internal short to ground in gas control or motor. Disconnect all wiring to control or motor and use an ohmmeter to check for shorts to ground. At no point should there be a reading between the electrical circuit of the motor, control and ground.

## GAS SUPPLY

Be sure manual gas valve is in the full open position. NEVER operate furnace with valve partially open.

## THERMOSTAT

Check to be sure thermostat is properly wired and is calling for heat.

## MALFUNCTION CIRCULATING AIR SWITCH

Be sure the circulation air switch is moving enough to close its contacts. If the switch is not closing, clean any dust or dirt from the actuator pin. Other reasons for the switch not operating are:

1. Insufficient fan speed (slow motor due to low charged battery, faulty motor or line and dust accumulation restricting return air to furnace). Check wiring in accordance with units wiring diagram to ensure that proper polarity of the 12 volt D.C. power is observed. This polarity must be observed so the motor will run in the proper direction of rotation to insure correct air delivery.
2. Faulty circulating air switch. Replace switch if there is no continuity through the contracts when the sail is closed. Switch should also be replaced if battery is fully charged and with fan motor running at normal speed the switch fails to close within 3 to 4 seconds.

## GAS CONTROL VALVE

Check valve terminals. If voltage is present, but valve does not open (when circulating air switch is closed), replace control valve.

## FAN NOT OPERATING

Check for burned-out motor, loose wiring terminals, blown fuse, tripped circuit breaker, or no power to the furnace.

## DEFECTIVE FAN RELAY

Relay may be at fault if motor fails to start within 60 seconds after thermostat calls for heat.

## EXCESSIVE BLOWER NOISE

1. Motor or blower wheel out of balance. Replace motor or blower wheel. Also blower wheel may need to be repositioned on the motor shaft if blower wheel is rubbing housing.
2. Motor hum. Replace motor.

## ERRATIC FAN OPERATION

A loose terminal, defective relay or reversed wiring polarity. May cause the motor to cycle off while the thermostat is calling for heat. Repair terminal or replace relay.

## **DIRECT SPARK IGNITION SYSTEM**

**DESCRIPTION:** The direct spark ignition system consists of a solid state printed circuit control module, an electrode assembly, a 12 volt gas control, and connecting high and low voltage wires. To ignite the burner, it is necessary only to set the thermostat. The thermostat, in series with the air prover switch, powers the ignitor to simultaneously open the main burner valve and provide the ignition spark. Should the flame not be established within a period of 7 seconds, the system provides safety shut down.

Electronic flame sensing circuitry in the ignitor detects the presence or absence of the main burner flame. If the flame is not established during the flame establishing period, the system closes the gas valve and locks out. If the flame is extinguished during the ignition cycle, the ignitor will provide one retry for ignition, before going into lock-out. To reactivate or retry for ignition, if lock-out has occurred, set the thermostat to the "off" position for 60 seconds, then reset to the "on" position.

## **TROUBLE SHOOTING GUIDE**

### **CAUTION**

**SERVICING THIS DEVICE SHOULD ONLY BE PERFORMED BY A QUALIFIED SERVICE-MAN WITH DUE REGARD FOR SAFETY AS IMPROPER ACTIONS COULD RESULT IN A HAZARDOUS CONDITION, RESULTING IN SERIOUS INJURY OR DEATH.**

### **WARNING**

**DO NOT APPLY POWER TO CONTROL MODULE UNLESS WIRING CONNECTIONS ARE COMPLETE AND ELECTRODE IS PROPERLY GROUNDED. USE EXTRA CAUTION IN AREAS WHERE HIGH VOLTAGE IS PRESENT.**

1. **INPUT POLARITY:** If a spark is present and the gas valve opens but the system shuts down after the trial period, check input voltage for proper polarity.
2. **GROUNDING:** It is essential to proper operation that the system be properly grounded. If a spark is present and the gas valve opens but the system shuts down after the trial for ignition period, check for proper ground.
3. **WIRING:** Check all wiring for proper and secure connections. Be sure the connector is fully engaged on the control board. Check the high voltage wire for proper connection at both ends. Clean any corrosion that may interfere with good electrical contact.
4. **HIGH VOLTAGE MALFUNCTION:** (See Caution below). If during the trial for ignition, the spark is intermittent (the valve may or may not open) the following should be checked:
  - a. Electrode spark gap — should be 1/8: 1/32".
  - b. Ceramic insulators — check for cracks.
  - c. Electrode lead wires — check for cracks or breaks.
5. **VALVE MALFUNCTION:** If there is power to the gas valve and a spark during the trial for ignition, but the valve will not open, check the valve for an open coil or other malfunction.

6. **ERRATIC OPERATION:** If the system operates properly for a period of time but randomly shuts down during the duty cycle, or will not operate during cold starts, check the flame proving circuit (sensor wire) with a D.C. Microamp Meter. The current should be 5-15 microamps. A low or marginal flame current may cause nuisance tripping. If this condition is experienced, the electrode location should be checked to make sure the sensor electrode is in the flame.

Low microamps can also be caused by too much combustion air.

The solid state control module is not field repairable. Any modifications or repairs could alter the function of sensitive electronic circuits, and cause unsafe operation.

